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REQUEST FOR CONTINUED EXAMINATION (RCE) TRANSMITTAL

Address to:
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Application Number	09 756,825
Filing Date	January 9, 2001
First Named Inventor	Kaoru Sagita et al.
Art Unit	1725
Examiner Name	Len Tran
Attorney Docket Number	2204-002205

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APR 23 2003
FC 1700

This is a Request for Continued Examination (RCE) under 37 C.F.R. § 1.114 of the above-identified application.

Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. See Instruction Sheet for RCEs (not to be submitted to the USPTO) on page 2.

1. Submission required under 37 C.F.R. § 1.114

- a. ☐ Previously submitted
- i. ☐ Consider the amendment(s) reply under 37 C.F.R. § 1.116 previously filed on _____
(Any unentered amendment(s) referred to above will be entered).
- ii. ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____
- iii. ☐ Other _____
- b. ☒ Enclosed
- i. ☒ Amendment Reply
- ii. ☐ Affidavit(s) Declaration(s)
- iii. ☐ Information Disclosure Statement (IDS)
- iv. ☒ Other One-Month Extension of Time

2. Miscellaneous

- a. ☐ Suspension of action on the above-identified application is requested under 37 C.F.R. § 1.103(c) for a period of _____ months. (Period of suspension shall not exceed 3 months; Fee under 37 C.F.R. § 1.17(i) required)
- b. ☐ Other _____

3. Fees

The RCE fee under 37 C.F.R. § 1.17(e) is required by 37 C.F.R. § 1.114 when the RCE is filed.

- a. ☒ The Director is hereby authorized to credit any overpayments to Deposit Account No. 23-0650
- i. ☒ RCE fee required under 37 C.F.R. § 1.17(e)
- ii. ☒ Extension of time fee (37 C.F.R. §§ 1.136 and 1.17)
- iii. ☐ Other _____
- b. ☒ Checks in the amount of \$ 750.00 and \$ 110.00 enclosed
- c. ☐ Payment by credit card (Form PTO-2038 enclosed)

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

Name (Print Type)	Paul M. Reznick	Registration No. (Attorney Agent)	33,059
Signature	<i>Paul M. Reznick</i>	Date	April 14, 2003

CERTIFICATE OF MAILING OR TRANSMISSION

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Name (Print Type)	Gloria J. Robinette	Date	April 14, 2003
Signature	<i>Gloria J. Robinette</i>		

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Translation

FR 1243333

TC 1700

Method of casting a material around elongate and curved hollow
parts, particularly curved or bent tubes or tube systems

To overcome the difficulties that occur when casting metal around
5 tube objects, in particular to prevent the walls of the curved tubes being
pushed in several times, and tubes several times, it has been
recommended *ante* to prevent liquid metal from penetrating these curved
r alia, in the sand casting or die casting process, to take measures that
consist, when casting metal around tubes, in making gases or liquids
10 flow under an adjustable back pressure through the cavity similar to a
runner, this back pressure having a value corresponding to the
deformation resistance of the tubes at the casting temperatures.

To seal the cavity of the tube against the liquid metal with which
15 it is surrounded, it has also already been recommended to fill the tube
with a plug, for example made of molding sand, or else to provide cores
forming plugs at the ends of the tubes, in order to close them off.

Much greater difficulties occur when metal is cast around curved
20 hollow parts, when this involves casting metal around them using a
compression casting process or an injection casting process (and
therefore in general in pressure die casting). In such a casting process,
the casting mold is filled not by the action of the weight of the metal, as
in sand casting or ordinary die casting, but by the action of an increased
25 pressure, which may possibly have a value of about 1500kg/cm², at the
same time as the liquid metal reaches relatively high flow rates.
Consequently, the metal penetrates even into the smallest cavities of the
mold, so that it is necessary to be certain that the tubular objects to be
surrounded with cast metal are absolutely sealed with respect to the

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cavity that is, in the mold, to be filled with metal.

Pressure die casting molds and consequently also the bent tubes or tube systems that are to be surrounded during casting and are placed in these molds are exposed to high mechanical loads during casting. A substantial increase in the mechanical stress occurs because of the frictional heat that is created owing to the metal flowing rapidly into the cavities of the molds. The frictional heat results in a further increase in the thermal stress. By this means, the endurance and buckling resistance of the tubes is lowered, the risk of their being crushed is increased and the initial position of the tubes or tube systems in the cavity of the molds is changed. Until now it has therefore not been possible to correctly embed curved hollow parts in liquid metal during casting by pressure die casting processes.

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According to the invention, this problem is solved by using curved tubes in the form of seamless drawn steel tubes having supports that are preferably placed at nodes or at branch-off points, and in the region of the ends of curves, and by furthermore using tubes that are covered with a thermally insulating protective layer such as, for example, a layer of a mixture of asbestos flour and sodium orthosilicate, on their outer surface, and finally by making sure that, by calculating the injection pressure and the rate of injection into the pressure die casting machine, the encapsulating metal solidifies against the curved hollow part to be embedded in the metal even before the casting mold has been entirely filled. To satisfy the latter condition, the piston of the pressure die casting machine is slowly advanced, until a defined pressure has been attained, after which the piston is advanced at a faster rate until the final pressure has been attained.

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The appended drawings show an illustrative example:

Figure 1 shows, partly in side view and partly in cross section, a tube that has been surrounded during casting with metal by the pressure
5 die casting process;

Figure 2 is a plan view that corresponds to Figure 1;

Figure 3 shows, partly in side view and partly in cross section, another embodiment of the tube to be embedded during casting;

Figure 4 shows the casting mold, with the tube to be embedded
10 during casting, and the method of operation of the receiving and sealing devices;

Figure 5 is a longitudinal section of the part cast with the tube embedded during casting;

Figure 6 is a cross section of the cast part, along the line A-B in
15 Figure 5; and

Figure 7 shows the construction of the two halves of the casting mold that constitute the cavity of the molds and the devices for receiving and sealing the tube to be embedded during casting, and also the position of the tube in the mold.

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As the cross-sectional representation in figure 1 shows, a seamless drawn tube a, which has been bent at b and c and has a branch-off at d, receives, for the purpose of being supported, tenons e similar to tubes, said tenons being fixed to the outer surface of the tube by welding. The
25 tube may also have, according to the representation shown in Figure 3, yet more branch-offs f that are perpendicular to the direction of closure of the mold and are supported by movable cores.

To embed a tube of this kind during casting, the tube is supported

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in the casting mold in the manner shown in Figure 4.

It proves to be advantageous to surround the tubes, before placing them in the pressure die casting mold ready to be used, with a thermally insulating protective layer g. This may advantageously consist partly of mixtures of asbestos flour and sodium orthosilicate. By this means, the metal penetrating the cavity of the mold undergoes premature solidification all around the bent tube or tube system before the entire mold has been filled with metal. In this way, the hollow part to be embedded during casting undergoes additional consolidation during casting.

To keep the tube firmly in the position fixed beforehand, it is advantageous to also use centering pins h. The centering pins are conical in shape and fit inside the tubes at their ends; however, the outside diameter of the centering pins causes a slight winding of the open ends of the tubes. In this way, pressure is applied, which, in combination with the tubular supports, prevents the tube from moving and also ensures that the open ends of the tubes are completely sealed, so that the molten mass penetrating the interior of the mold cavity at high pressure and at high speed cannot penetrate the interior of the tubes. Indicated in Figure 7 are the tools i that are used to be able to fit the centering pins and also to remove them.

It is also possible, in particular cases, to seal the ends of the tubes by welding, for the purpose of preventing penetration of the liquid metal under the action of the casting pressure.

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SUMMARY

Method of encapsulating, by casting, elongate and curved hollow parts with metallic materials, in particular bent tubes and tube systems, characterized by the following points, taken separately or in
5 combination:

1. The tubular parts, which are to be embedded during casting and are in the form of seamless drawn steel tubes, are held or supported, in particular at the nodes or at branch-off points, and in the region of
10 the ends of the curves, by supports specially fixed to the tubes, preferably by welding, in the mold ready to be used for pressure die casting, and the surface of the curved hollow parts to be embedded during casting are furthermore provided with a thermally insulating layer.
- 15 2. Mixtures of asbestos flour with sodium orthosilicate are used as the thermally insulating protective layer.
3. Conical centering pins are provided in the casting mold, these being used to fix the position of the tubes to be embedded during casting and to seal off the open ends in order to prevent penetration
20 of the metal entering the mold, since the centering pins are engaged in the open ends of the tubes.
4. The pressure and the casting speed in the pressure die casting machine are calculated so that the metal cast around the parts solidifies all around the curved hollow parts to be embedded during
25 casting, even before the casting mold has been entirely filled.

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